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ABSTRACT

This investigation, which was part of a larger dissertation study, examined high-level performance in groups of people with developmental disabilities and the instruction that facilitated such performance. Specifically, it focused on those aspects of instruction that appeared to be particularly effective in eliciting a high level of performance in musical performance groups. The participants for the study were directors of and the performers in five separate handbell choirs. The ringers in four of these handbell choirs (n=56) were individuals with mental retardation or developmental disabilities, whereas the performers in the fifth group consisted of individuals who did not have disabilities. Three major categories emerged from the data collected in the study, distributed cognitive load of producing a musical piece, scaffolding, and situated practice. Results found that the primary difference in the instruction by the directors of the groups with developmental disabilities was that directors adopted more of the cognitive load and planned for the task so that the ringers had less processing they had to manage. These directors also monitored the ringers in the group much more on a local level, for example, the mechanics of how an individual was ringing a bell. (Contains 41 references.) (CR)

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COMPETENCE IN INDIVIDUALS WITH MENTAL RETARDATION

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COMPETENCE IN INDIVIDUALS WITH DEVELOPMENTAL DISABILITIES

The development of instructional techniques for individuals with developmental disabilities is a critical social, educational, and political issue. Assuming a 3% prevalence rate for the occurrence of developmental disabilities, there are approximately seven million people with developmental disabilities in the United States. Legislation such as Public Law 94-142 and Public Law 101-476 (Individuals with Disabilities Education Act) mandate that specialized education and job training be provided for individuals with developmental disabilities. Thus, there exists a significant segment of the population that, by law, should receive specialized instruction.

There have been few studies from the field of cognitive psychology that have focused on the effective instruction of individuals with developmental disabilities. This is suprising given that one of the most salient variables that affects learning in a traditional classroom is the teacher. Blanton, Blanton, & Cross (1993) stated that "we know very little about the knowledge possessed about instruction by regular and special education teachers, and especially how these groups of teachers think about, discuss, and approach instruction for special learners." Researchers do agree that how a teacher structures instruction, monitors student progress, and remediates errors in learning strongly influences the acquisition and performance of a skill. How this instruction might be similiar to or different from that delivered to individuals with developmental disabilities has not been sufficiently explored, however.

In this investigation, which was part of a larger dissertation study, high level performance in groups of people with developmental disabilities, and the instruction that facilitated such performance, was examined. A number of researchers (Campione, 1987; Ferretti, 1989; Ferretti & Cavalier, 1991; McFarland & Wiebe, 1987) have noted that studies have not been conducted that examine competence or even domain knowledge on learning in persons with developmental disabilities. The cognitive deficits consistently associated with developmental disabilities (e.g., in attention and self-monitoring skills) seem initially to preclude the possibility that an individual with developmental disabilities could exhibit highly skilled performance. However, there is evidence that these individuals *do* occasionally display high-level skill in some areas, for example, in computation and in music (see Ericsson & Faivre, 1988; Miller, 1987, 1991a). This study focused on those aspects of instruction that appeared to be particularly effective in eliciting a high-level of performance in musical performance groups.

Theoretical Background

The theoretical framework of social constructivism, in which both the teacher and the learner are seen as active participants in the instructional process, views learning as a dynamic process. The following theories, which have their roots in social-constructivist theory, were employed in examining how competence was expressed in the participating groups for this study.

The Zone of Proximal Development

A cognitive theory that has recently gained popularity is that of Vygotsky's (1979) zone of proximal development. Vygotsky defined this concept as follows:

> It is the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaborations with more capable peers (p. 86).

An individual's mental development, given this concept, is determined by both his or her actual developmental level and the zone of proximal development. An individual's abilities are assessed not only by his or her own independent abilities, but by his or her ability to imitate and learn under the guidance of others. Brown and French (1979) have discussed scaffolding in connection with IQ tests, concluding that the level of potential development might be a useful corollary to psychological tests.

While a Vygotskian perspective is less commonly adopted when investigating learning in individuals with developmental disabilities than are other approaches, some researchers (e.g., Palincsar & Klenk, 1992; Stone & Wertsch, 1984) have popularized the use of this theory to examine learning in exceptional learners. In this work, instruction is seen as influencing development by assisting persons with cognitive deficits to do what they could not otherwise do, thus further facilitating their development (Whitman, 1990). The term "scaffolding" is closely associated with the concept of the zone of proximal development and used to describe how a more skilled individual assists a child or less knowledgeable person in developing competencies. Scaffolding is generally the transfer of responsibility of learning from one individual to another and is usually seen as providing a temporary, but necessary, form of support for an individual attempting to learn a new skill (e.g., Bruner, 1978; Wood, Bruner, & Ross, 1976). Scaffolding is then a way of illustrating what an individual could potentially achieve, provided that the proper support was in place during the learning process.

Social interactions are seen by Vygotsky as being the central mechanism by which cognition develops. Learning and performance are seen as a social activity rather than an individualistic phenomenon, and much emphasis is placed on the dynamics that occur in a given instructional setting. Development of competence, according to Vygotsky, does not simply involve a transfer of information from a more knowledgeable individual to a less knowledgeable one, but can also possibly involve groups and dyads (Wertsch & Hagstrom, 1990). Work such as that of Palincsar and Brown (1984, 1989), in their conception of reciprocal teaching, and Rogoff (1991), in her concept of guided participation, has attempted to extend Vygotsky's theory and to build instructional techniques for use in classroom settings.

Socially Shared Cognition

The concept of socially shared cognition is another concept that has its roots in social constructivism. Theorists that discuss shared cognition (e.g., Lave & Wenger, 1993; Resnick, Levine, & Teasley, 1991; Rogoff & Lave, 1984) see cognition as a phenomenon that is not bounded by the limits of individual cognition. Instead,

cognition is the product of social interactions, of acquired cultural knowledge, and of language. As such, cognition is seen as always highly social in nature.

Situated Cognition

Proponents of the related theory of situated cognition (e.g., Brown, Collins, & Duguid, 1989: Lave, 1993; Suchman, 1987) argue that learning and cognition cannot be studied separately from the context in which they take place. This conceptualization is in stark contrast to the way that empirical research is usually conducted wherein laboratory controls are used to "eliminate" contextual elements. In situated cognition perspective, all cognition is seen as dependent upon the context that surrounds it. Therefore, when examining skilled performance, studies in this area researchers (Lave, 1991; Lave and Wenger, 1993; Suchman, 1987) have taken into account the contextual variables surrounding the focus of interest.

Shared Expertise

Shared expertise is the concept that a group of individuals may collectively perform at a higher level than could any one member of that group (Brown & Palincsar, 1989; Palincsar & Brown, 1984). Both cooperative learning techniques and expert scaffolding (e.g. Brown & Palincsar, 1989) have been proposed as instructional methods that may be used in group settings.

While instructional studies which use the concept of shared expertise generally report increases in the individual knowledge bases of the participants (e.g. Brown & Palincsar, 1984; Palincsar & Brown, 1989), they have not evaluated the expertise level of the group as an outcome measure. Nor have they examined the group for the characteristics of expertise (Chi, Glaser, & Farr, 1988) that have been described in individuals.

Salomon, Perkins, and Globerson (1991) described skilled collaboration in their discussion of how computer technologies can support intellectual performance. They saw one of the effects of a partnership with technology, such as computers, as potentially undertaking a significant part of the cognitive processing that otherwise would have to be managed by the individual alone. In this way, the learner is able to function at a level that exceeds the level at which he or she could usually function. The end product of such a partnership between the person and the technology is of a higher quality than the individual could produce alone.

Theoretical Perspective

These social constructivist views on cognition shaped the findings from this study and provided a theoretical framework with which I interpreted its findings. The beliefs that I hold about persons with developmental disabilities also undoubtedly shaped the interpretation of the data from this study. I view the label of *developmental disabilities* as one that is socially defined- rather than a pathology that resides in the individual. This orientation is consistent with Mercer's (1973) and Goodnow's (1986) views on the socially and culturally constructed nature of our definitions of intelligence. It is also related to viewpoints held by some theorists (e.g., Bronfenbrenner, 1979; Cole, 1991; Vygotsky, 1981) that psychological functioning, as well as how we interpret that functioning, is a product of context and culture.

Method

In the last twenty years, a small but growing number of researchers in education and related disciplines have been using qualitative research methods (Stainback & Stainback, 1988). Part of the utility of these procedures lies in understanding more fully the environment surrounding individuals with developmental disabilities. In addition, such an approach has been suggested by investigators (Jacob, 1990; Skrtic, 1986) in the field of special education as an appropriate alternate framework for conceptualizing current issues in the field. Skrtic (1986) in particular has criticized positivist models in research as inherently value-laden in their approach to developmental disabilities as types of pathological conditions.

In accordance with suggestions from Lincoln and Guba (1985) credibility of the findings from this study was established through several methods: (a) triangulation of the data, wherein several methods, namely stimulated recall procedures, interviews, observations, self-participation in the activities and informal conversations, were used in collecting the data and multiple sources, namely directors, handbell ringers, and other individuals associated with the groups, were used to construct the final model; (b) prolonged engagement with the groups participating in the study; (c) referential adequacy, wherein some potion of the data was not included in the original data analysis but reserved so that it might be compared with the resultant model; (d) negative case analysis where the emergent categories and relationships among them were tested to verify that they accounted for the data obtained; and (e) member checks, where the participants who could read were given back transcripts from the stimulated recall procedures and interviews, and the theoretical model for commentary and editing. Dependability was partially established by the above attempts at credibility, also by the informal monitoring of the analysis by a colleague and by the more formal monitoring of experts comprising the dissertation committee itself. Confirmability is indicated by the use of triangulation of the data. Transferability may be established by the reader from the thick description of the phenomenon and context that follows in the reporting of the results of this study.

Research Questions

In accordance with the suggestions of Strauss and Corbin (1990), initial research questions guided the data collection and analysis of the data for the larger study. These research questions were developed so that they would give sufficient flexibility and freedom to explore the skilled performance in individuals with developmental disabilities in depth. Two questions from the larger study will be examined for the purposes of this paper:

1. What was the nature of instruction in these groups that may or may not "scaffolded" skilled performance in individuals with developmental disabilities while they were learning a new piece of music?
2. To what extent did the performance level of each group seem to be dependent upon the director of the musical groups?

Participants

The participants for this study were the directors of and the performers in five separate handbell choirs. The ringers in four of these handbell choirs were individuals who are labeled as being mentally retarded or developmental disabled, whereas the performers in the fifth group consisted of individuals who were not disabled. The groups were selected for this study because they (a) had been in existence for at least five years, (b) performed publicly frequently and in response to invitations from organizations not connected to the group, and (c) had an established repertoire of music that they performed. The criteria of group membership, experience level, and a given level of performance (an established repertoire of music) in choosing groups that might be considered to be skilled were used. In addition, a selective sampling was used in that each of the directors of the five groups conducted his or her group differently. Finally, the groups of performers were selected because they differed with regard to their residential placements and levels of developmental disabilities.

Choir #1. Choir #1 was located in a large metropolitan city in California. It consisted of 19 adult performers with developmental disabilities, the majority of whom had Down Syndrome. Most of the performers in Choir #1 lived at home with their parents. The group practiced once a week in a community center for adults with developmental disabilities.

This group had been actively performing for five years at churches, community events and, recently, at a major league baseball game. During the Christmas season, they performed as often as five times a week, although at other times of the year they performed three to four times a month.

I spent from November 16th to the 24th with Group 1. I observed and videotaped three practices and three performances and observed the groups members and director daily at the center. I also stayed overnight at the center with several of the bell ringers before an early performance the next morning. I looked through the musical charts the groups used. I interviewed the director and two bell ringers over the process of learning the musical piece "Let It Snow!". These interviews resulted in three hours of audio tapes from Elaine, and approximately 90 minutes of tape from each of the bell ringers, Tracy and Henry. Additionally, I interviewed the accompanist and seven other ringers in the group formally, and spoke with all of the ringers informally. Artifacts in the form of musical scores and programs were collected.

A modified stimulated recall procedure was used with the director and the two bell ringers after each practice and after the final performance. These procedures produced data in the form of audio tapes and my observational notes on their performance.

Choir #2. The performers in Choir #2 lived in a state school that maintains 700 clients in a large city in the southwestern United States. At the time of this study, there were seven members of this choir. Because of deinstitutionalization in the last several years, this choir had undergone considerable attrition and changes in its membership. Choir #2 had been in existence for more than 20 years, although most of the present members of the choir had been together for a little over five years.

Choir #2 played weekly at the chapel at the state school, three or four times a year at local churches, and at local community events. They had also, at the time of this study, been invited to perform at the opening of the city convention center that was attended by several thousand people.

I observed this group during the months of September to December. I videotaped and interviewed the director and group members over a period of five weeks in October and November, generating approximately ten hours of audio tape. I observed five practices and two performances during that time and visited five of the choir members in their homes during this time period, attended several church services and a Christmas program at the state school. I interviewed the director and two members of the choir during the process of learning "Hark the Herald Angels Sing" and we reviewed the videotapes of each practice in a modified stimulated recall procedure. I also watched several videotapes of practices with two additional members of the handbell choir.

Choir #3. Choir #3 consisted of eleven men who lived in a residential facility in a rural area south of a major metropolitan area in Texas. The music director, Patrick, also conducted the choir using direct cueing. However, some of the members of the Choir #3 held two bells during practices and Patrick cued several performers, or one performer with two bells, to play them simultaneously.

The choir performed at least twice a month in a chapel at the residence and each June at a musical festival on the grounds of the facility. They also performed for local church services, nursing homes, and area events three or four times a year.

I informally observed this group from September to December. I videotaped and interviewed the participants over a five week period in October and November as they practiced the piece, "Sweet Hour of Prayer". I videotaped and observed five practices and three performances. I observed members of the group during a two day trip I took with the choir to a town some 200 miles away from the area, and visited informally with several members of the choir in their group home. In addition, I substituted for a sick bell ringer in this choir during part of a practice.

Choir #4. Choir #4 was located in a small town in the southern United States, and, like Choir #1, was part of a community center for individuals with developmental disabilities. The choir consisted of 19 performers with a wide range of developmental disabilities. The choir was established thirteen years ago, and, although not all members had been in the choir for that length of time, a minority of the performers had remained in the group for the duration. Practices were twice a week at the community center, except for when the group is preparing for a performance, when the practices became daily.

The director, whom I will call Brian, had led the choir for the entire period of its existence. Brian used a method developed by Cannella (1976), known as the Kodaly method, in which a certain hand position is used to indicate each scale tone. His use of the Kodaly method was sufficiently sophisticated so that the group could play pieces containing as many as four octaves and 79 chordal textures.

Choir #4 performed extensively. During the year they performed two or three times a month at churches, community events and at the request of social organizations. In November and December, performances were particularly frequent. During one holiday season, they performed at the United States White

House where one observer commented, "I didn't know any of those people had handicaps!"

I visited this group briefly for two days at the end of October, and then from December 13th to the 19th. I videotaped and observed three practices of what Brian calls his "A" choir, and two practices of the "B" choir. The "A" choir practiced "The First Noel" over the three days I observed and I interviewed Brian and three participants over the course of learning the piece. I rode the bus home with the majority of the bell ringers each day, ate lunch with them in the cafeteria and visited with them during the day at the center. Brian is the music director for nine other schools in the district. I traveled with him to several schools where he was preparing newly formed handbell and chime choirs for upcoming Christmas performances and attended two of these performances.

Choir #5. Choir #5 consisted of performers who were not mentally retarded. The choir was located in the same metropolitan city as was Choir #2 and was one of three handbell choirs in a large church. Group #5 performed at least monthly for church services, although during the Christmas season they often performed at other churches.

I observed this group from September to October and observed five practices and two performances. I followed two bell ringers and Sam over a four week period as they practiced the piece "Regal Procession". I interviewed eight members of this choir, accompanied them when they socialized after practice, and had many informal conversations with both Sam and the choir members.

Handbell Performance

Handbell performance is readily observable. Each performer must play his or her bell in an obvious and definite manner in order to produce a chime. In addition, the nature of handbell ringing is procedurally rich. There are a series of discrete responses each player must make in each musical piece and a series of motor responses he or she must make to elicit sound from the bell. It also relies more on gross motor, rather than on fine motor skills because the necessary action for playing the bell comes from the arm and wrist, rather than from the fingers. Individuals with limited fine motor capabilities, such as is often demonstrated by individuals with developmental disabilities, can more readily produce sound from a handbell, as opposed to, for example, a guitar or piano, which depend on finger dexterity.

Handbells range in size and weight. The smallest handbells are only two to three inches long beyond the handle and weigh mere ounces. The largest bells can have a foot-long brass base and weigh almost thirty pounds. The bell handles are curved and from four to five inches long. Inside of a handbell, the clapper may be adjusted to make a clear ringing sound or a muted sound. The clapper swings from a fixed joint so that if moved laterally, it makes no sound at all. A spring tension inside of each bell may be adjusted to loosen or tighten the swing of a clapper.

In order to ring a bell correctly, a ringer must have a requisite extent of procedural knowledge because there are at least as many ways to ring a bell incorrectly as there are to ring one correctly. The bell must be held by its handle, because any contact with the bell surface will distort or muffle the sound of a ring.

The bell must be turned in the correct direction so that the clapper fully strikes the side of the bell. Sound is usually produced by using a long, downward swing that culminates in a slight flick of the wrist that propels the clapper to strike the side of the bell. After striking a note, the bell must be maintained in an upward position so that the sound of the note travels outwardly from the sides of the bell. Lowering the bell or turning it after a ring again distorts the sound. After the full value of the note the bell has rung has been reached, the bell is then lifted so that the clapper may fall back into its original position. The task of ringing in synchrony with other ringers is difficult in that while performing, handbell ringers have a limited ability to hear the other ringers in the group. The director is then responsible for pulling the different rings that are occurring into a synthetic whole.

The majority of choirs ring from two to five octaves, with the majority of them ringing three octaves. Depending on the number of individuals in a choir, a single bell ringer may ring anywhere from one to more than fifteen bells. With additional bells, the task for a ringer usually becomes more complicated because he or she must then anticipate the change of the bells in their hands so that the circular downward motion may be begun that is required to make a bell ring.

Procedure

The data gathering took place between September of 1992 and January of 1992. Several methods were used to obtain qualitative data in this study: interviews, a stimulated recall procedure, observations, and a participant-observer stance. Information was obtained from direct observation, videotapes and from stimulated recall procedures. Each director was asked to inform me of an upcoming performance that would occur during the data collection period. I then observed, from the initial practice to the final performance, each group's rehearsal of a new piece of music for the upcoming performance. The amount of time each group was observed therefore varied. However, the range of practices observed was between a total of two and six. In addition, data included my own experiences as a novice handbell ringer and a diary focusing on my experiences at weekly rehearsals and occasional performances.

Interviews

An initial interview was conducted with each director before observations of the practices began. An additional interview was conducted after the director had chosen a piece of music that the group would perform for its upcoming performance.

All interviews with the directors were tape recorded and transcribed. In addition, each director was asked to watch a videotape as soon as possible after each practice and the final performance using a modified stimulated recall procedure. In this modified procedure, I found that if I responded to the directors and participants as they made comments, they were much more verbal and went into more detail about what was happening in each group. I began conducting these interviews in this more relaxed fashion after the first week of data collection. The directors were asked to verbalize their reactions to what they observed on the videotape and to comment on their interactions with the performers. The directors were encouraged

to make any additional comments about the practice or performance. Again, these comments were tape recorded and transcribed.

This same modified simulated recall procedure was also used with at least two members of each handbell choir following each practice. At least two of the same members of each choir were interviewed after each of the practices. These members were selected by the directors as individuals who (a) had sufficient verbal ability to discuss their performance, (b) were amenable to an interview, (c) had several years of experience as a member in the handbell choir, and (d) exhibited what the director believes is a "high level of skill" in performing in the choir. In a pilot testing of the stimulated recall procedure with individuals with developmental disabilities in Group 3, I found that some participants were able to give only very limited responses while viewing videotapes. Therefore, depending on the verbal ability of some of the performers and their ability to participate in the stimulated recall procedure, the a list of questions was used to supplement the viewing of the videotape of the practice or performance.

The interviews were tape recorded and transcribed for all of the ringers in Groups 1, 3, and 5. Groups 2 and 4 were used to code the data selectively, in that the data were analyzed with respect to the categories that emerged from the analysis of the data from Groups 1, 3, and 5, and were only partially transcribed. However, all of the tapes were reviewed orally and relevant categories were recorded on three-by-five cards.

Observations

An initial observation took place to pilot the data collection procedures, to acclimate the participants to my presence, and to familiarize myself with the environmental context. I also directly observed the practices in preparation for the final performance and the performance itself in Groups 1, 2, 3, and 5. These observations were compiled, along with a review of the videotapes of the practices and performances, into a single observational transcript of each session. In these transcripts, I included both a narrative recounting of what occurred during the sessions and commentaries on what interactions and behaviors that occurred in each group. Many of the audio tapes were partially contextualized by the sound of the videotape being reviewed in the background. When comments were obscure or unclear, videotapes were reviewed along with the audio tapes.

Analysis

All practices and performances were videotaped. Reviews of the tapes were compiled with observational notes made during the session. In order to analyze the data, I used coding procedures described in Strauss and Corbin (1990) and comparative analysis (Glaser & Strauss, 1967). In comparative analysis, data are constantly compared and analyzed, which allowing the investigator to identify conceptual categories and to develop a theoretical explanation to explain the phenomena that are being observed. In addition, comparative analysis may be used to verify theory, either theory that has emerged from the data or existing theory. In this study, comparative analysis was used both to verify the theory that was developed over the course of the investigation, and to test the existing theory of

expertise. As part of attempting to generate a theoretical model from the data, data collection, coding, and analysis were intermingled.

All interview and observational transcripts were analyzed using open coding. As part of this process, the data were examined, compared, conceptualized and categorized (Strauss & Corbin, 1990). The interview transcripts were initially analyzed using a line-by-line analysis, wherein coding was thickly and consistently applied to the transcripts, although, as categories emerged from the data, I chose to focus on only those themes in my later analyses. Observational transcripts were analyzed as entire documents.

Observations, transcripts, field notes, results from the stimulated recalls, and interviews were initially analyzed separately for Choirs 1, 3, and 5. Conceptual labels were formed from each transcript and tallied. Concepts were then grouped together to form tentative categories. The emerging categories were hierarchical, abstracted units that contained subcategories resulting from the open coding. These categories later became conceptual units of the emerging theory. A decision was made on which of the emerging phenomena had the richest source of properties, or characteristics. At this point, analysis was focused on one central phenomenon. After completing open coding on Groups 1, 3, and 5, I confirmed the emergent categories with the data from Groups 2 and 4. The decision to code data selectively from Groups 2 and 4 was made because of the richness of the categories that had emerged from the analysis of the data at that point and as a method of increasing the credibility of the analysis.

Axial coding, wherein connections between categories were made, followed open coding. Following the paradigm model suggested by Strauss and Corbin (1990), categories established in open coding were identified as denoting the phenomenon, causes/conditions, contexts, action/interaction strategies, intervening conditions or consequences of the phenomenon. The phenomenon refers to the central idea or event around which the categories that have emerged from open coding are organized. Causal conditions are those events or incidents that lead to the occurrence or development of the phenomenon. The context represents both the specific set of properties, or characteristics of the phenomenon and the particular set of conditions within which the action/interaction strategies are taken. These action/interaction strategies are evolving, purposeful, and goal oriented in nature and are enacted in response to or in order to manage the phenomenon of interest. Finally, the intervening conditions are those conditions that facilitate or constrain the action/interactional strategies taken within a specific context.

Selective coding was used to relate the core phenomena to the other categories that emerged from the data and to validate these relationships. Selective coding is similar to the previously described axial coding but is done at a higher level of analysis. The core category was developed in terms of its properties and its dimensional range and other categories were related to this core category. The story line was then formulated analytically. For the purposes of this paper, only the analysis of the action/interaction strategies that related to the competence exhibited by the groups will be discussed.

Categories

The following section describes three major categories that emerged from the data collected in this study and the relationship of these categories to skilled performance in individuals with developmental disabilities.

Distributed Cognitive Load

The cognitive load of producing a musical piece was divided among the director, the ringers, and the method of direction itself. How the load was distributed was dependent to a great degree, upon the expertise of the director, the expertise of the ringers, and the time for practice. In Group 1, much of the cognitive load was given over to the chart method that was used. It required the director to remember a limited amount of music, yet it demanded that the ringers remember their note and to play when the director pointed to a box that contained it. The more bells a player had, the more complex this task became for the ringer. The director could ease the load by giving a ringer fewer bells, or two bells with the same letter, but different colors representing different octaves.

In Groups 2 and 3, the director was responsible for more of the cognitive load. The method itself, that of direct cueing, was simple, required much musical knowledge on the part of the director to employ, and took on little of the cognitive load. The task for the ringers would also seem to be simpler. They did not have to wait for a certain signal or letter, they only had to play when pointed to. I do not think, however, that their task was a simple one. When substituting for a ringer in Group 3, I found that I had to have a focused, sustained attention on Patrick, the director. Because Patrick improvised a great deal, I could never be completely sure of when he would point to me. When he did cue me to ring, I had to be consciously careful to bring my bell down in conjunction with the downbeat that he gave. Although at this point in the study I had been ringing in a handbell choir myself for two months, Patrick had to correct me frequently at first. At the end of the practice, I still had not mastered ringing in this manner.

In Group 4, the ringers were responsible for carrying much more of the cognitive load. They had to remember the hand signals for the bells that they played, the chords that they played on, and when they might not play on a given chord or signal, given the piece that was being directed. Brian was responsible for giving the hand signals, but because the music was written in the hand signal notation in front of him, he did not necessarily have to memorize these signals. Of interest to me was Brian's frequent use of ringers as directors. He would have them come up to the front, refer to the music in front of them and conduct the rest of the ringers. The ringers that I observed doing this were very competent, though initially slower than Brian, at conducting. The method, once written, carried much of the load and allowed for greater complexity of the music, without being demanding upon the director. The ringers were responsible for a large number of chords and chordal textures, that were different for each piece. The consequence of the ringers taking on more of the load was greater complexity of the resultant musical piece.

In Group 5, the director had to take on relatively less of the cognitive load. Sam did not have to transcribe music, nor did he communicate the music directly to the ringers. Each ringer was responsible for interpreting which bell was to be played next by reading the music in front of them. The music itself contained much information; the notes to be played, their value, the tempo, so that the load was weighted more heavily on the side of the music and the ringers.

Scaffolding

Scaffolding occurred even before the groups practiced a new piece, when the director planned how the group would play the piece. It was during this time when he or she decided which ringer would receive what bell, and how many bells each ringer would play. Scaffolding also occurred on a local level when an individual ringer encountered difficulties in playing his or her part. At these times, the director would usually step in to interact with the ringer. The overarching category of scaffolding is comprised of planning, monitoring, and modeling. This category consistently was subsumed or overtook the strategic category of situated practice, depending on whether the difficulties encountered by the group were on a local or a holistic level.

Planning. Planning was a sub-strategy within the general category of scaffolding that was usually employed by the directors to enhance the musical output of the group. Directors were responsible for assigning bells to the ringers in the group. They did so based on their knowledge of the ringer's abilities and the demands of the musical piece at hand. For the directors of Group 1 and 4, planning as it related to the music to be practiced was more involved because they had more responsibility with regards to transcribing the piece of music. The directors of Groups 2 and 3 had to plan which ringers would handle which bells, which seemed to be dependent upon which bells were more pivotal in the practiced piece. In Group 5, Sam also considered carefully which ringers he would assign which bells, although some of the ringers, such as Tim and Lee, were always assigned the same bells. In Groups 1 and 4 most of the planning occurred before practice occurred. In the other groups, modifications were made during the process of practicing a piece.

In Group 5, planning also occurred at the level of an individual ringer. Charles, for example, had to plan, to some extent, how he was going to move his bells. This type of need for planning, however, was the result of playing through the piece initially. It was not planning that took place before practice began.

Monitoring. I found evidence of constant self-monitoring during the stimulated recall procedures in the ringers without developmental disabilities in my stimulated recall procedure. I found plentiful, but less frequent reports of self-monitoring in those with developmental disabilities. In the later cases, monitoring frequently arose in response to comments the director had made previously to them during a rehearsal, although those without developmental disabilities did occasionally make statements such as, "Sam told us we were rushing that martellato," or "Sam told me to work out whichever bells I could handle." Individuals with developmental disabilities could readily point out their mistakes and give me reasons for why they thought they were having trouble, ("Looking at someone else, I guess," "I kept on watching my bell," "I wasn't concentrating. You

have to watch Mr. Brian"). A few of the ringers displayed self-monitoring (shaking their head, quickly switching bells) during rehearsals *before* any correction from the director.

In the groups with developmental disabilities, the directors were able to do more monitoring of individual difficulties that the ringers had because of the method of direction that was used. Directors could tell if ringers were paying attention to the music they were signaling or not. Sam, the director of the group without developmental disabilities, was not able to monitor whether ringers were paying attention to the music, or even if they were looking at the correct measure, he could only monitor the musical output. His monitoring was on a less local level. The ringers of Group 5 were responsible for self-monitoring their part of the piece. The directors of the ringers with developmental disabilities, in contrast, had a greater ability to monitor which ringer was doing what. This compensated for the varying levels of self-monitoring the ringers themselves did. However, in all of the groups, the director was the monitor of the quality of the music as a whole, because he was the only person who could hear all of the bells playing together.

In both the ringers with developmental disabilities and those without, monitoring led to modifications only when a difficulty was encountered by the ringer. As a piece was learned, fewer modifications needed to be made by a ringer. Perhaps because more of the cognitive load rested upon the ringers in Group 5, these ringers mentioned more monitoring thoughts during the stimulated recall procedures. Those with developmental disabilities mentioned fewer, perhaps because the director took on more of the monitoring function for these ringers.

Modeling. Modeling was another sub-strategy under the category of scaffolding. Novice ringers had ample opportunity to observe and emulate more experienced ringers. Directors had ringers learn their parts together. Novice ringers did not sit out and simply observe during practices nor were they first put through a sub-skills training, but rather they were immediately and intimately involved in practicing the piece at hand. I observed the induction of ringers in both Groups 1 and 3. Ringers were given minimal initial instructions and then immediately became part of the practice.

An apprenticeship of sorts was served by novice ringers. In Group 1, they were first given chimes rather than bells. In Groups 3 and 4 they were given just one bell in the beginning. More bells over time were added when the director had determined that the ringer had mastered one bell.

Situated Practice

Situated practice was another category of strategy used by the groups. All of the groups practiced the skills necessary for handbell ringing within the context of practicing musical piece. Directors would introduce a piece and the group would begin practicing it from beginning to end. Modifications to a piece were made as the need arose. When an individual ringer needed correction on a certain technique, a director would comment on the problem and then either continue the practice or repeat the measures in which the problem had occurred.

Directors seemed to believe that it was important to practice a piece under circumstances that were as similar to the actual performance circumstance as

possible. They asked ringers who were not going to be at an upcoming performance not to play during a rehearsal, or, for example, Sam, would ask ringers to only play their own bell, not those of a missing ringer, so that each ringer focused on his or her own part in the piece. All of the directors had their ringers stand in the same positions that they would during the performance of the piece. These practices were very much "dress rehearsals" in that they attempted to simulate the performance circumstances as closely as possible.

The groups practiced under similar physical circumstances as they would be performing in. Evelyn, in Group 2, always had ringers seated during practices, except for the practice before a piece was to be performed when she would have the ringers stand through the performance. Sam had his ringers practice the two pieces they would be playing during a service in the same order as they would perform them. He also had the group meet early before the services to run through the pieces one more time; not because they needed more rehearsal, but to warm-up and remind the ringers of the pieces. This group, as was the case with Groups 2 and 3, practiced in the same location in the sanctuary as they would play in during the Sunday services. Because Groups 1 and 4 usually performed in locations different than they practiced in, they could not usually do the same.

Individual ringers also dealt with problems in ringing as they occurred. When Kevin in Group 3 had trouble with double ringing his bell, he recalled having had the same problem in the past and adjusted his physical movement accordingly. Tracy, in Group 1, would damp her bell when she discovered she had made an error. Chuck, in Group 2, began counting to himself so that he would remember his sequence of four rings. These strategies were produced, however, by the demands of the situation. They were not employed in advance.

Discussion

Recently, some researchers (e.g., Lave & Wenger, 1991; Resnick, Levine, & Teasley, 1991; Rogoff, 1991) have asserted that cognition may be socially shared, that it may take on a social nature that is not constrained by the individual mind. In this study, constant reference was made, in interviews, stimulated recalls and casual conversation, by all participants, to how their performance was intimately integrated with and dependent upon the collaborative efforts of those in the group. Directors of the groups were thought of and participated as part of the handbell choirs and, together with the ringers, contributed to the production of music. The method of direction that the director used and the written music that was used by the groups were tools that aided and guided the activity. Even the quality of an individual ringer's contribution was constrained by contextual features outside of the individual ringer, such as the types of cues given by the director or the time spent on practicing a piece. It was appropriate, therefore, to treat the groups, rather than the individual members of the groups, as the primary unit of social and cognitive analysis. Because handbell ringing is a group activity, it may be that the social nature of the domain itself contributed greatly to the appearance of shared cognition in these groups. It may be that this type of cognition is particularly the case when a group is responsible for a product.

Distributing the Cognitive Load

The concept of distributed labor is a traditional area of interest to cultural anthropologists. In the handbell choirs in this study, music-making was an activity in which ringers, directors, and the directional method shared the cognitive load required in performing a piece of music. Cole (1991) pointed out that in "the notion of *sharing cognition* is that sharing often means both 'having in common' and 'dividing up' at the same time" (p. 398). In the handbell choirs in this study, the group members shared the common goal of learning a piece of music. The cognitive tasks within the context of music-making were distributed among the group members.

The idea that cognition may be socially distributed has been found in real world examples, particularly in that research conducted within the workplace (e.g., Hastie & Pennington, 1991; Lave & Wenger, 1991; Scribner, 1984). In these circumstances, not all individuals within the organization share the same knowledge. The activities of the group do not even necessitate that all members of the group be present at the same time. However, the accomplishment of the group's goals is made possible by the different contributions of individuals in the group. Another analogy that may be used is that of team sports. While one offensive player on a football team may be superior, it is also the contributions of the other offensive players, the defense team, and the coach (who in actuality never even touches the football) that come together to win a game. Hutchins (1991) suggests that the organization of a group itself contributes to the cognitive qualities of a group. Differences in two teams, therefore, could depend on differences in how the teams are organized, who is put in as first-string quarterback, for example, in addition to the properties of the individuals on the two teams.

I believe that partly because handbell playing was an activity that could be shared among the group members, the groups with developmental disabilities were able to achieve the high level of competence that they did. Perhaps one of the reasons that individuals with developmental disabilities are considered to be generally less competent is that we assess their capabilities on the basis of their individual abilities, rather than their capabilities within an assisted or group structure. This concept is reminiscent of the argument that Salomon, Perkins, and Globerson (1991) advanced in their discussion of how computers might support cognitive processes in assuming a large part of processing that otherwise would have to be regulated by the person. Assessment of ability then is directed at the joint partnership of person and machine, rather than of individual performance.

Situated Practice

Theories of situated cognition (e.g., Brown, Collins, & Duguid, 1989; Lave, 1988; Lave & Wenger, 1991; Resnick, 1991; Suchman, 1987) have asserted that the social and physical context in which cognition takes place is an integral part of the cognition that occurs. As such, cognition is not a decontextualized, stable phenomenon. It is a response to, a product of, and an agent in a given situation. In this tradition, Lave (1991) described learning not as the individual internalization of information from the

environmental milieu, but as "a process of becoming a member of a sustained community of practice" (p. 65).

The concept of situated cognition does much to reframe conceptually the activity of handbell ringing in this study. Learning techniques and the signs for new notes continually took place within the context of learning a new piece of music. Inexperienced and novice ringers learned along side those who were more experienced, eventually acquiring new bells or being assigned bells that were more active during a piece. Ringers were part of a community activity practicing a craft.

Transfer of skills by individuals with normal intelligence is rare in the research literature, and almost nonexistent in individuals with developmental disabilities. The handbell ringers in this study, however, did apply their skills across different pieces of music. The theory of situated cognition attributes the lack of transfer found in laboratory settings to the idea that all learning is situated. The problem with this view is then that there is no such thing as general knowledge that may be applied across situations. Brian, the director of Group 2, repeatedly pointed out that the ringers learned their cues within the context of a piece. However, he explained that transfer of knowledge of the cues learned occurred because the ringers has seen the cues before in several other similar musical pieces. In this way, reading the correct musical cues is both situated, yet also is a transferable tool that can then be applied to similar musical contexts.

Scaffolding

Scaffolding took place in the groups in two circumstances. First, directors planned how they would direct their groups, which ringers would be assigned which bells, and the music the group would play. Planning was particularly in evidence in the groups with developmental disabilities. These directors anticipated difficulties their ringers would have in producing a piece together and took steps to support performance in their groups.

Scaffolding particularly took place in the modeling and monitoring directors gave to individual ringers who encountered difficulties. They would stop the practice, provide instruction, and attempt to problem solve with the ringers. It is interesting that scaffolding was not as evident between the director and the group as a whole, but took place either before the practice or on an individual basis.

Scaffolded Skill

One of the questions for the purpose of this study was, "What is the nature of instruction in these groups that may or may not 'scaffold' skilled performance in individuals with developmental disabilities while they are learning a new piece of music?" Instruction in these groups did seemed scaffolded, as well as situated. Skills were rehearsed in the context of practicing pieces as a whole. Direct instruction usually came as result of the director's monitoring of the ringers practicing a piece in its entirety. Often directors would model the appropriate physical movement to use or point out another ringer as an example. Novices took part in the activity peripherally or with decreased responsibility in the form of fewer bells. Directors attempted to structure practices so that they were as similar to performance conditions as possible.

The primary difference in the instruction of the directors of the groups with developmental disabilities was, again, that directors adopted more of the cognitive load and planned for the task so that the ringers had less processing they had to manage. These directors also monitored the ringers in the group much more on a local level, for example, the mechanics of how an individual was ringing a bell.

Dependence upon the Director

The second question that guided this study was, "To what extent does the performance level of each group seem to be dependent upon the director?" Once again, I see a greater degree of cognitive weight placed upon the directors of the groups with developmental disabilities. I see the demands upon the directors of Groups 2 and 3 as being similar. To a large part, this is because the directional method the two directors use is similar. However, in assessing more load upon the directors, music in these groups can be improvisational and new pieces learned rather quickly.

In Group 1, much of the cognitive load was passed from the director onto the method she used. In many respects, this method was the least demanding upon the director because once a chart was completed, the director did not need to alter it or to know any musical notation at all. The trade off was that the director had to take much time to transcribe the notation onto the scroll initially.

The participants in Group 4 probably had the highest cognitive challenge of all the groups with developmental disabilities. Not only did they learn specific signals for a single bell, but they also learned chordal signals on which to play. In addition, these chords varied from song to song and within a song, depending on the musical piece. The memory task, then, was greater. However, the director also took on a substantial cognitive load in that he had to rewrite a musical piece using the modified Kodaly notation, conduct using this notation, and modify the piece depending on the sound of a piece once the group practiced. The result of placing a greater cognitive load on both himself and the ringers was a more complex quality to the music that the group plays.

In Group 5, the cognitive load was predominately upon the ringers and the musical score itself. Neither Sam nor the ringers had to memorize the piece because the score functioned as a tool that they could use as a repository for the musical piece. Again, the result of this distribution was a more complex quality of musical output.

Implications for Future Research;

This study seems to have implications regarding the instruction of individuals with developmental disabilities. In the groups observed, individuals with developmental disabilities were able to sustain attention, to perform consistently in a group situation, and transfer the skills that they had learned while practicing one piece of music to another piece of music. Their ability to perform at a high level of competence had much to do with the nature of the task being one that they could share, rather than one for which they were solely responsible. The directors were able to distribute the cognitive load, scaffold learning, and situate the learning so that these individuals were able to participate successfully in the activity.

Given previously noted difficulties in transferring learning noted in this population, the methods these directors used merit consideration by educators. Perhaps allowing individuals with developmental disabilities to engage in what Lave and Wenger (1991) term *legitimate peripheral participation* can facilitate learning and transfer in a manner that traditional instructional methods do not.

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